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## The Prevalence of Speech and Hearing Disorders Among Inmates at the North Dakota State Penitentiary

Pamela Kay Strom

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THE PREVALENCE OF SPEECH AND HEARING DISORDERS  
AMONG INMATES AT THE NORTH DAKOTA  
STATE PENITENTIARY

by  
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Bachelor of Science, University of North Dakota, 1972

A Thesis  
Submitted to the Graduate Faculty  
of the  
University of North Dakota  
in partial fulfillment of the requirements  
for the degree of  
Master of Science

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1974



This thesis submitted by Pamela Kay Strom in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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Permission

Title The Prevalence of Speech and Hearing Disorders Among  
Inmates at the North Dakota State Penitentiary

Department Speech Pathology and Audiology

Degree Master of Science

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Date April 17, 1974

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## ABSTRACT

This study was designed to determine the prevalence of speech and hearing disorders at the North Dakota State Penitentiary. Recommendations for suitable follow-up services for speech and hearing disorders were made to the administrative staff of the penitentiary.

Subjects for this study consisted of eighty-seven male inmates at the North Dakota State Penitentiary. The speech of each subject was evaluated to identify speech disorders of articulation, voice, and/or fluency. Articulation disorders were identified from scores obtained by the subjects on the Arizona Articulation Proficiency Scale: Revised. Voice and fluency disorders were identified on the basis of the examiner's clinical experience and judgment. A hearing screening evaluation was administered to each subject to identify hearing disorders which might impair communication. Hearing screening was completed on a Maico portable audiometer calibrated to ISO-1964 values. Subjects were individually screened at 25 dB re ISO-1964 for the frequencies 500, 1000, 2000, 4000, and 6000 Hz.

Analysis of the speech and hearing evaluation results showed that 32.18 per cent of the subjects had speech disorders and 8.04 per cent of the subjects failed the hearing screening test. When these figures were compared to estimated prevalence figures for the general population of the United States, this subject group demonstrated a considerably higher prevalence of speech and hearing disorders.

## CHAPTER I

### INTRODUCTION AND REVIEW OF LITERATURE

At the time of this study, speech and hearing diagnostic and therapeutic services were cursory in the majority of state penal institutions in the United States of America. Patuxent Institution in Jessup, Maryland, was found to be the only penal institution in the United States with a program of speech and hearing testing and treatment. That institution was the only state penal institution which had a full-time speech pathologist who provided direct diagnostic and therapeutic services in a prison speech and hearing clinic (Walle and Morris, 1967; Walle and Reading, 1971). From a total of approximately five hundred state prisons in the United States, fewer than fifteen had even minimal speech pathology or audiology services (American Speech and Hearing Association, 1973). The North Dakota State Penitentiary in Bismarck, North Dakota, followed this national trend and offered no speech or hearing diagnostic or therapeutic services to inmates.

The President's Commission on Law Enforcement and Administration of Justice (1967) stated that suitable screening programs should be developed in penal institutions to assure that all inmates are given medical attention and treatment as needed. It was the premise of this

study that speech and hearing problems warrant vital concern in the planning of a total rehabilitative program in penal institutions.

The prevalence of speech disorders for all age levels in the total population of the United States had been estimated at 5 per cent (American Speech and Hearing Association Committee on the Midcentury White House Conference, 1952). The United States Department of Health, Education, and Welfare (1967a) estimated that 2.7 per cent of the adult population in the United States had a significant hearing impairment based on an average hearing level of 41 dB re ISO-1964 or greater for the speech frequencies in the better ear.

Deck (1965) reported a higher prevalence of speech and hearing disorders in a Kansas state penal institution when compared to the estimates given for the total population in the United States. Speech disorders were exhibited by 15.04 per cent of the subjects. Articulation disorders were found in 8.11 per cent of the subjects, fluency disorders in 3.87 per cent, voice disorders in 0.60 per cent, and miscellaneous speech disorders were found in the remaining percentage. Hearing screening completed at 15 dB re ASA-1951 at the frequencies 500, 1000, 2000, and 4000 Hz was failed by 57.62 per cent of the subjects.

Blom (1967) found a higher prevalence of both speech and hearing disorders in two state penal institutions in Indiana when compared to estimates for the total population in the United States. He reported speech disorders in 12.2 per cent of the subjects in one institution and in 11.6 per cent of the subjects in the other

institution. Hearing screening was completed at 25 dB re ISO-1964 at the frequencies 500, 1000, 2000, 4000, and 8000 Hz. The criterion for failure on the hearing screening test was no response at any two consecutive test frequencies in the same ear. Hearing disorders using this criterion were found in 35.0 per cent of the subjects tested at one institution and in 18.9 per cent of the subjects tested at the other institution.

Melnick (1970) found that 40 per cent of the subjects tested at a state penal institution in Ohio failed a hearing screening test completed at 30 dB re ISO-1964 for the frequencies 250, 500, 4000, 6000, and 8000 Hz and at 25 dB re ISO-1964 at 1000 and 2000 Hz. His criterion for failure was based upon classification of subjects in one of the following categories: I) passed; II) failure at two or more frequencies in the same ear at the test frequencies 4000, 6000, and 8000 Hz; III) failure at two or more frequencies in the same ear with only one of the failures in the speech frequencies 500, 1000, and 2000 Hz; IV) failure at two or more speech frequencies in the same ear. Only subjects classified in category IV, which included 5.6 per cent of the subjects, were scheduled for more extensive hearing evaluation.

The American Speech and Hearing Association (1973) appointed a task force to study speech pathology/audiology service needs in prisons. After an extensive review of published and unpublished information and after personal contacts with informed individuals, the task force concluded that limited information was available concerning the communicatively handicapped population in prisons which indicated

that the prison population was a neglected group in the area of speech and hearing testing and treatment. From an analysis of the studies available, the task force conservatively estimated that 10 to 15 per cent of prison inmates had a communication disorder in speech or hearing which was a significantly greater percentage than that found in the general population. In addition to a higher prevalence of speech and hearing disorders, the task force found the disorders to be more extensive and to require concentrated remediation. As a result of these findings, the task force stated:

. . . coordinated social, educational, and medical services are needed to rehabilitate the adult prisoner. Speech pathology and audiology services should be an integral part of a total diagnostic, educational, and rehabilitative program.

Walle and Reading (1971) reported that when a total program, including speech and hearing services, was incorporated in the rehabilitation program of a prison, there was a decrease in the rate of recidivism or rate of return. It was difficult to determine the extent to which the speech and hearing programs alone contributed to this decreased rate of recidivism. However, the speech and hearing program seemed to be a necessary part of the total rehabilitation program.

Since the North Dakota State Penitentiary was among the state penal institutions not providing speech and hearing diagnostic or therapeutic services to inmates, it seemed logical that before such services might be considered for possible implementation as an integral part of a rehabilitative program at the penitentiary, there

was a need to determine whether such services were justified. Therefore, after determining the prevalence of speech and hearing disorders at the North Dakota State Penitentiary, consideration was given to the incorporation of speech and hearing services as part of a rehabilitative program at the institution. The purposes of the present study were as follows:

- 1) to provide a speech and hearing evaluation service to the inmates at the North Dakota State Penitentiary,
- 2) to describe the results of speech and hearing evaluations completed at the North Dakota State Penitentiary,
- 3) to compare the results of the speech and hearing evaluations completed at the North Dakota State Penitentiary with similar studies, and
- 4) to consider suitable speech and hearing follow-up services as part of a rehabilitative program at the North Dakota State Penitentiary based upon the results of the present study.

## CHAPTER II

### PROCEDURES

Speech and hearing evaluations were conducted at the North Dakota State Penitentiary in Bismarck, North Dakota, and at the North Dakota State Prison Farm in Bismarck, North Dakota, during a period of time from December 27, 1973, through January 3, 1974. These two penal institutions were under the same administration and were considered as one institution for the purposes of this study. Results of this study were reported and compared with the results from similar studies. Speech and hearing follow-up procedures, based upon the results of speech and hearing evaluations completed in this study, were recommended to the administrative and clinical personnel of the institution in individual speech and hearing evaluation reports (Appendix A) and in compiled summary reports.

Evaluations were conducted in various locations throughout the institution based upon availability of rooms, convenience of subject arrival and departure for evaluation, and consideration of acceptable noise levels. Subjects were informed that the evaluations were being conducted by an individual not connected with the penitentiary and that the results of the evaluation would be available to each subject upon request.

General speech and hearing information was procured for each subject to establish rapport. Each subject was then given an individual speech evaluation and hearing screening test. The examiner described the results of the speech and hearing evaluation for each individual subject in a speech and hearing evaluation report (Appendix A). These individual reports with compiled summary reports were presented to the institution upon completion of this study as reference for follow-up services.

#### Subject Selection

At the time of this study there were 173 male inmates at the institution. Seventeen were not eligible for this study for reasons of work release, educational release, maximum security, or failure to have completed orientation procedures as required for new arrivals. This study was conducted with the remaining 156 eligible inmates at the institution as the target population.

Institutional regulations demanded that only those inmates who cooperated voluntarily could serve as subjects for this study. Seventy-five of the 156 eligible inmates were obtained as subjects from an initial request for volunteers. Initial subjects volunteered by signing bulletins posted throughout the institution describing the purposes of the evaluation. To examine the nature of the speech and hearing of the remaining target group of inmates who had not initially volunteered to serve as subjects; a sample of twenty inmates from this remaining group was selected from a table of random numbers. Of these twenty inmates, who were individually contacted by the penitentiary



staff, twelve responded favorably to the second request for volunteers and were included as subjects in this study. The combination of these two groups of subjects resulted in a total of eighty-seven subjects ranging in age from seventeen to seventy-three with a mean chronological age of 27.9 years.

To project the speech and hearing evaluation results obtained for these eighty-seven subjects to the target population of 156 inmates, it became of concern to determine whether the reason or reasons for not responding to the initial request for volunteers were related to distinct differences with respect to the speech and hearing disorders being studied or to some unknown factor. It was the premise of this study that there were no speech and/or hearing differences between the two groups of inmates tested and thus the reason or reasons for not volunteering were not related to the study criteria.

#### Speech Evaluation

The objective of the individual speech evaluation was to identify subjects who demonstrated speech disorders of articulation, voice, and/or fluency. For the purposes of this study, the following description of speech disorders as given by Berry and Eisenson (1956) was used: ". . . if attention, to a significant degree, is distracted from the communication to the individual's communicative effort, then his speech may be considered defective." This judgment was made by the examiner.

The sentence form of the Arizona Articulation Proficiency Scale: Revised (Fudala, 1970) was the speech articulation test

administered to each subject. Articulation disorders noted were all disorders of speech intelligibility which the examiner evaluated as errors of substitution, omission, addition, and/or distortion of a speech sound or sounds. For the purposes of this study, dialectal variations in speech articulation were not considered to be articulation disorders. Each subject who exhibited articulation disorders of substitution, omission, addition, and/or distortion not related to dialectal variations, was given a speech intelligibility score and was classified in one of six categories according to interpretation procedures described in the manual of the Arizona Articulation Proficiency Scale: Revised and as summarized on the individual speech and hearing evaluation reports (Appendix A).

Judgments of vocal quality were made by the examiner. Disorders in vocal quality were described as hoarse, harsh, breathy, hypernasal, and/or denasal and were included in the individual speech and hearing evaluation reports.

Fluency was evaluated by the examiner during the entire evaluative session. Judgments of disfluency were based upon speech characterized by repetitions, blockings, and/or prolongations of sounds, syllables, or words which disturbed the rhythm of speech. Brief descriptions of noted disfluency were indicated on the individual speech and hearing evaluation reports.

Any subject judged to have articulation disorders, disorders in vocal quality, and/or fluency disorders received a recommendation for follow-up diagnostic and possible therapeutic services. The

direction and implementation which this follow-up service assumed was determined and managed by the penal institution based upon the individual speech evaluation reports which contained a description of the speech disorder with suggested procedures to follow in further testing and/or treatment.

#### Hearing Screening Evaluation

The purpose of the hearing screening evaluation was to identify subjects with a possible hearing disorder impairing communication. The Subcommittee on Noise of the Committee on Conservation of Hearing (1964) set a level of 26 dB re ISO-1964 as the beginning point of hearing disorders impairing communication. Therefore, a screening intensity level of 25 dB re ISO-1964 for the test frequencies 500, 1000, 2000, 4000, and 6000 Hz was used in this study.

Measurements of the sound pressure level in decibels of background noise in the audiometric test rooms were made using a General Radio Company sound survey meter, Type 1565-A. The sound pressure levels varied from 40 to 45 dB in the test rooms and were considered to be permissible levels for the absence of masking at the screening intensity level used in this study (U.S. Department of Health, Education, and Welfare, 1967b). Thus, it was assumed that the test environments were conducive to valid hearing screening evaluation.

Hearing screening was completed on a Maico portable audiometer which was calibrated to ISO-1964 values immediately prior to testing.

The screening test was administered manually to each individual subject using pure tone sound stimuli.

The classification system of Melnick (1970) was adopted as a model in the establishment of categories for the hearing screening evaluation. Subjects were classified in one of three groups according to their responses to pure tone sound stimuli as indicated on the individual speech and hearing evaluation reports (Appendix A). The criterion for failure on the hearing screening evaluation was no response at any two or more speech frequencies in the same ear upon tonal presentation at 25 dB re ISO-1964. Subjects who failed this screening test were classified in Group 3 and subsequent recommendations for more extensive audiometric evaluations were made. The direction which this follow-up service assumed was determined and managed by the institution based upon individual hearing evaluation reports which contained a description of the hearing disorder with suggested procedures to follow in further testing.

### CHAPTER III

#### RESULTS

Table 1 shows the number of subjects in each test group and the number of speech and hearing disorders found in each group. The computation of the total number of subjects tested and the total number of subjects found to have speech and hearing disorders is also shown.

TABLE 1  
NUMBER OF SUBJECTS WHO DEMONSTRATED  
SPEECH AND HEARING DISORDERS

	Initial Subject Group	Second Subject Group	Total Subjects Tested
No Speech or Hearing Disorders	45	7	52
Speech Disorders	24	4	28
Hearing Disorders	6	1	7
Total Subjects Tested	75	12	87

A chi square procedure performed on the data in Table 1 resulted in  $X^2 = .01148$  ( $p > .99$ ). This value was not statistically significant which indicated that there was no systematic difference

between the two groups of subjects with regard to the study criteria. It was thus assumed that the reason or reasons for not volunteering for this study were not related to speech and/or hearing disorders. Since there were no significant differences in the speech and hearing results from the two subject groups, the results obtained from the total number of subjects tested were projected to the total target population of the institution.

#### Speech Evaluation Results

The prevalence of speech disorders found in this study was considerably higher than either that found in studies completed in other penal institutions or than that reported for the total population of the United States. Twenty-eight subjects or 32.18 per cent of the subjects tested demonstrated speech disorders. Articulation disorders singly were found in twenty-three subjects or in 26.44 per cent of the subjects. Subjects judged as having articulation disorders obtained speech intelligibility scores in three of the six categories of the Arizona Articulation Proficiency Scale: Revised (Fudala, 1970). These three categories were as follows: sound errors are occasionally noticed in speech (fourteen subjects), speech is intelligible although noticeably in error (six subjects), and speech is intelligible with careful listening (three subjects). Articulation disorders with voice disorders were found in two subjects or in 2.30 per cent of the subjects. Subjects found to have articulation disorders with voice disorders obtained speech intelligibility scores in two of the six categories of the Arizona Articulation Proficiency Scale: Revised.

These two categories were as follows: sound errors are occasionally noticed in speech (one subject) and speech is intelligible although noticeably in error (one subject). One subject or 1.14 per cent of the subjects tested was judged to have a voice disorder singly. All three subjects with voice disorders demonstrated hoarse vocal quality. Fluency disorders were found in two subjects or in 2.30 per cent of the subjects. Table 2 shows the number and percentage of subjects found to have speech disorders of the above type.

TABLE 2  
THE PREVALENCE OF SPEECH DISORDERS FOUND AT THE  
NORTH DAKOTA STATE PENITENTIARY

Type of Speech Disorder	Number of Subjects	Percentage of Subjects
Articulation Disorder	23	26.44
Articulation Disorder with Voice Disorder	2	2.30
Voice Disorder	1	1.14
Fluency Disorder	2	2.30

In comparison, Deck (1965) found 15.04 per cent and Blom (1967) found 12.2 per cent and 11.6 per cent of subjects tested in penal institutions to have speech disorders. The prevalence of speech disorders for the total population in the United States was reported at 5 per cent (American Speech and Hearing Association Committee on the Midcentury White House Conference, 1952). Table 3 compares the percentage of speech disorders found in other studies completed at

penal institutions with the percentage of speech disorders found in the present study.

TABLE 3  
COMPARISON OF THE PREVALENCE OF SPEECH DISORDERS  
FOUND IN PENAL INSTITUTIONS

Study	Percentage of Speech Disorders
Deck (1965) N=1,602	15.04
Blom (1967) N=1,630	12.2 and 11.6
Strom N=87	32.18

#### Hearing Screening Results

Failure on the hearing screening evaluation (Group 3) with subsequent recommendation for follow-up was demonstrated by 8.04 per cent of the subjects in this study. Only upon follow-up threshold testing will it be possible to directly compare the subjects in this study with the general population estimate of 2.7 per cent reported to have hearing disorders. The general population estimate of hearing disorders is based on an average hearing level of 41 dB re ISO-1964 or greater for the speech frequencies in the better ear (U.S. Department of Health, Education, and Welfare, 1967a).

When using similar criteria for classification of hearing disorders, the prevalence of hearing disorders among the subjects of this study was lower than that found by Deck (1965) and higher than



that found by both Blom (1967) and Melnick (1970) in studies completed in penal institutions. Table 4 compares the percentages of hearing disorders found in studies completed at penal institutions with the percentages of hearing disorders found in this study.

TABLE 4

COMPARISON OF THE PREVALENCE OF HEARING DISORDERS  
FOUND IN PENAL INSTITUTIONS

Study	Percentage of Hearing Disorders	Criteria for Classification as a Hearing Disorder	Differences in Classification Criteria
Deck (1965) N=1,602	57.62	No response at 15 dB re ASA-1951 at 500, 1000, 2000, or 4000 Hz	No change
Strom N=87	43.00	No response at 25 dB re ISO-1964 at 500, 1000, 2000, or 4000 Hz	
Blom (1967) N=1,630	25.00 and 18.90	No response at any two consecutive frequencies in the same ear at 25 dB re ISO-1964 at 500, 1000, 2000, 4000, and 8000 Hz	Substitution of 6000 for 8000 Hz in the Strom study
Strom	38.00	No response at any two consecutive frequencies in the same ear at 25 dB re ISO-1964 at 500, 1000, 2000, 4000, and 6000 Hz	
Melnick (1970) N=4,858	5.60	No response at two or more speech frequencies in the same ear at 30 dB re ISO-1964 at 500 Hz and at 25 dB at 1000 and 2000 Hz	Substitution of 25 dB for 30 dB

TABLE 4--Continued

Study	Percentage of Hearing Disorders	Criteria for Classification as a Hearing Disorder	Differences in Classification Criteria
Strom	8.04	No response at two or more speech frequencies in the same ear at 25 dB re ISO-1964	at 500 Hz in the Strom study

## CHAPTER IV

### DISCUSSION AND RECOMMENDATIONS

Considering the relatively high prevalence of speech and hearing disorders found among the subjects tested at the North Dakota State Penitentiary, the need for a speech and hearing testing and treatment program was apparent. The feasibility of incorporating a speech and hearing service in a rehabilitative program at the institution should warrant official consideration. As previous studies have shown, speech and hearing problems are neglected areas of service in penal institutions despite their significantly higher prevalence when compared to prevalence figures for the general population in the United States (American Speech and Hearing Association, 1973). If the purpose of penal institutions is rehabilitation, speech and hearing problems require serious consideration.

Projection of the prevalence of speech and hearing disorders found in the subject group of this study to the total target population of 156 inmates, would result in fifty inmates with speech disorders and twelve to thirteen inmates with hearing disorders. These figures alone clearly demonstrate the need for providing speech and hearing services in the institution.

Rationale for providing speech and hearing services in penal institutions is supplied in the 1973 American Speech and Hearing

Association task force report. The task force concluded that a person who cannot communicate effectively, is handicapped in his efforts to be socially and/or economically successful and that a speech and/or hearing disorder may contribute to criminal behavior. To the extent that such a statement is true for even one individual, it is the premise of this study that speech and hearing services are justified as part of a rehabilitative program in penal institutions.

It would be advantageous to incorporate a routine program of speech and hearing screening tests for each inmate upon arrival at the institution as part of the examination and orientation procedure. Follow-up services for all possible speech and/or hearing disorders could be directed to appropriate sources at that time. Any decision to incorporate speech and hearing services in the rehabilitative program at the North Dakota State Penitentiary must be initiated by the administrative personnel at the institution with financial and various other types of support determined by other agencies. It is anticipated that the results of this study will receive serious official consideration in the planning of rehabilitative programs at the institution and that speech and hearing services will become part of a rehabilitative program at the North Dakota State Penitentiary.

APPENDIX A

INDIVIDUAL SPEECH AND HEARING EVALUATION  
REPORT

SPEECH AND HEARING EVALUATION REPORT

North Dakota State Penitentiary  
Bismarck, North Dakota 58501

Name \_\_\_\_\_ Age \_\_\_\_\_ Date \_\_\_\_\_

GENERAL SPEECH AND HEARING INFORMATION

Have you ever had a speech problem? \_\_\_\_\_ Do you think that you have a speech problem presently? \_\_\_\_\_ Have you ever had a hearing problem? \_\_\_\_\_ Do you think that you have a hearing problem presently? \_\_\_\_\_  
Explain any of the above:

SPEECH EVALUATION

Articulation

- \_\_\_\_\_ No speech errors noticed in testing
- \_\_\_\_\_ Sound errors are occasionally noticed in speech
- \_\_\_\_\_ Speech is intelligible although noticeably in error
- \_\_\_\_\_ Speech is intelligible with careful listening
- \_\_\_\_\_ Speech intelligibility is difficult
- \_\_\_\_\_ Speech is unintelligible

Voice

Fluency

Summary of Speech Evaluation

HEARING SCREENING EVALUATION

	500	1000	2000	4000	6000
Right ear					
Left ear					

Audiometer: Maico portable  
Screening Level: 25 dB ISO  
Noise Exposure: \_\_\_\_\_  
Legend: (+) = passed  
(-) = failed

- Classification: \_\_\_\_\_ Group 1 - Passed  
 \_\_\_\_\_ Group 2 - Failure at two or more frequencies in the same ear with only one of the failures in the speech frequencies  
 \_\_\_\_\_ Group 3 - Failure at two or more speech frequencies in the same ear

Summary of Hearing Screening

EXAMINER IMPRESSIONS AND RECOMMENDATIONS

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